9.1 Fiber Services

The list of SONET based services continues to grow. Clear and timely communications among the market-facing LOBs, Customer Network Engineering (CNE), Network Planning and Facilities Management Centers is necessary to ensure that the loop network provides the architecture mandated by the tariffs. While this document does not provide a comprehensive explanation of all SONET based services, the following information is intended to clarify the relationship between loop architecture and SONET based services:

- **Intellilight® Dual Wire Center (IDWC)** (Bell Atlantic South) - A SONET based service that provides separate dual paths for a circuit via multiple CO rings with automatic protection switching. It requires near 100% local loop, interoffice, and wire center survivability. It utilizes shared access, self-healing SONET ring architecture.

- **SONET Access Loop Termination (SALT)** (Bell Atlantic South) - A SONET based transport service that provides two separate fiber paths from the customer's premises through the primary and alternate serving COs. Basic SALT service does not require electronics (SONET add/drop multiplexer) at the alternate serving CO. It requires near 100% fiber path survivability. It utilizes shared access, self-healing SONET ring architecture.

- **NYNEX Enterprise SONET Private Network Service (NESPNS)** (Bell Atlantic North) and **Intellilight® Custom SONET Ring (ICSR)** (Bell Atlantic South) - SONET based services that allow the customer to determine transmission speed and node locations using *dedicated*, self-healing SONET ring architecture. These services should not be confused with shared access CAR or SALT ring architecture. At least one node must be in a Bell Atlantic CO. Provides near 100% fiber and nodal survivability.

- **SONET Access Broadband Transport (SABT)** (Bell Atlantic South) - A SONET based broadband transport service for premise-to-premise or premise-to-wire center connections to equal speed services, such as ICSR. The customer may optionally request fiber path diversity and/or 4-fiber 1+1 protection. Transport architecture may be linear point-to-point or self-healing ring, depending on the customer's requirements.

- **Alternate Serving Wire Center (ASWC)** - *This is not a SONET based service.* This service allows the customer to have high capacity circuits directed to a Bell Atlantic designated alternate CO, bypassing the primary serving CO. The tariff for this service makes no provisions for fiber or nodal survivability. However, it can be combined with SALT service to enhance network survivability.

NOTES:

1. Facilities Management will receive inquiries from Customer Network Engineering (CNE) during the pre-sale process for the services shown above.

2. Special construction charges may apply to the services shown above. Refer to item 9 in the Planning, Design and Deployment Considerations section for more information.

9.2 Ring Architecture

The design of SONET loop rings shall be in accordance with the Transport Planning and Engineering Handbook. Following are the four levels of SONET loop ring architecture to be considered for deployment in Bell Atlantic:

Note: When IDWC is requested as a 'end user to hub' design and the hub office is on the same ring as the end user, the rings mentioned in items 1, 2 and 3 will qualify for the IDWC service and guarantee.

1. **Customer Access Ring (CAR)** - This is a SONET self-healing ring that is available to multiple customers (shared access). With the exception of the C.O. and customer entrances, it has physically diverse fiber constructed through the primary serving CO *and at least one other CO*, providing near 100% fiber survivability. SONET add/drop multiplexers are deployed at the primary serving CO, the secondary (alternate) serving CO and at each customer's rate demarcation point (RDP). These are the physical loop components required to deliver IDWC and SALT (with ASWC) services.

2. **SONET Access Loop Termination Ring (SALT ring)** - This is a SONET self-healing ring that is available to multiple customers (shared access). With the exception of the C.O. and customer entrances, it has physically diverse fiber constructed through the primary serving CO *and at least one other CO*, providing near 100% fiber survivability. SONET add/drop multiplexers are deployed at only the primary serving CO and at each customer's RDP. These are the physical loop components required to deliver basic SALT service (without ASWC). Since this architecture does not provide a secondary (alternate) CO node (SONET add/drop

multiplexer), its deployment should only be considered if there are no known or no reasonably foreseen requirements for IDWC or ASWC services. A SALT ring can be upgraded to a CAR by adding the second CO node when IDWC or ASWC services are requested.

3. **Diverse Loop Access Ring (Route Diversity)** - This is a SONET self-healing ring that is available to multiple customers (shared access). With the exception of the C.O. and customer entrances, it has physically diverse fiber constructed to the *primary serving CO only.* This provides near 100% loop fiber survivability. This architecture does ***not*** satisfy the requirements for IDWC, SALT, ASWC or other services that guarantee wire center nodal survivability.

4. **Folded Loop Access Ring** - This is a SONET self-healing ring that is available to multiple customers (shared access). Loop fiber survivability is not guaranteed. Fibers may share the same cable sheath and physical path. While some fiber route diversity may exist, the design does not meet the requirements of the two architectures mentioned in items 1 and 2. Folded rings should only be considered when achieving fiber route diversity is inhibited by time constraints, topographic limitations, and /or economic justification.

9.3 Planning, Design and Deployment Considerations

1. SONET network elements must be properly inventoried in TIRKS. SONET rings are to be classified in TIRKS per NE-A96-007. Accurate system software record-keeping is essential to ensure ring interoperability and SONET-based services provisioning.

2. Every effort should be made to upgrade embedded SONET rings to the latest Bell Atlantic approved system software. At a minimum, all SONET rings must utilize system software versions that support SONET-based services. Direction for future software release upgrades will be provided by Network Planning - Transport Planning (PR-A96-123 and FP-G96-014: SONET Transport and DCS Software Upgrade Process).

3. Bell Atlantic is planning deployment of the Network Element Management System with future enhancements that will enable centralized software downloads and will be administered by the Network Operations Centers (NOC).

4. SONET network elements must be provisioned in compliance with Bell Atlantic standard operations support systems. Network surveillance systems are necessary to provide proactive alarm monitoring and performance monitoring. Since circuit-level performance monitoring is required on some SONET based services, the placement of low speed cards with performance monitoring capabilities is recommended at remote digital nodes delivering hi-cap services.

5. Only Bell Atlantic approved products (hardware, plug-ins, software and termination devices) are to be deployed.

6. SONET loop transport system deployment should utilize ring electronics, whether physical fiber diversity exists or not (folded ring). This allows for adding nodes and migrating to diversely routed fibers more gracefully at a later date. General deployment of linear (point to point and add/drop) electronics is not recommended.

7. Remote digital nodes for shared access rings should only be placed in secure locations that provide Bell Atlantic personnel unlimited (24 hour) access. Locations that are leased by individual customers and not considered part of a building's common space should be reviewed for potential expansion problems and future possibility of stranded investment.

8. SONET loop ring planning and design decisions must be aligned with the CO Digital Cross-connect Systems (DCS) and Interoffice Facilities (IOF) strategic plans. Refer to the Digital Cross-connect section of this guideline for more information.

9. For the architecture and services mentioned in this document, special construction charges may apply only to the required infrastructure additions (fiber, conduit, etc.) associated with routing necessary to the secondary (alternate) CO. All nodal equipment will be funded from the Baseline Capital budget and special construction charges for electronics will not apply with the following exceptions: when it has been determined that, in Bell Atlantic's best interests, SONET electronics are not to be used (i.e. less that seven DS-1s), and the customer still wants a SONET Ring, then the fiber, structure and the SONET ADMs are charged. This process is done by CNE on a special assembly and is funded from the Operating program budget.

10. Network Facilities Planning (NFP) is accountable for directing SONET loop ring deployment. FMC/DBT personnel should not alter any existing SONET loop ring or deploy any new SONET loop ring without NFP concurrence. The planning/decision process should include input from various work groups (e.g. FMC/DBT, CNE, IOF Planning, DCS Planning, Forecasting, LOBs, etc.).

11. Some basic considerations are: IOF and loop fiber requirements; CO equipment procurement; SONET ADM CO terminations (manual DSX, electronic DSX, DS1, DS3, STS1, optical, etc.); potential SONET based service offerings; hi-cap growth; topographical characteristics. The planning and design of any loop ring other than a CAR should consider future migration to CAR architecture.

12. Network Facilities Planning is accountable for monitoring the utilization of SONET loop network elements and establishing effective triggers for relief.

13. Funding for customer dedicated rings (ICSR, NESPNS) is provided from the Operating Program budget.

14. All shared access SONET loop rings are funded from the Baseline Capital budget and may require additional economic support documentation.

15. Wherever possible, diverse entrance facilities both into the CO as well as into the customer premise should be built and utilized.

10.0 SERVICE SOLUTIONS

The following are some **examples** for service requirements and possible solutions:

Scenario 1

Forecast Requirements: no DS-0's and 3 DS-1's at first location and 20 DS-0's and 4 DS-1's at second location.

Distance from CO: 6 KF first location, 12 KF second location.

Location Type: Strip mall with four small businesses at first location. Business building with ten small businesses as tenants.

Existing facilities: 600 pair copper cable with 50 spare pairs at both locations.

Solution: Place 24 fiber cable to serve both locations, 12 for first location and 12 for second location. Study route to ascertain if any additional fiber cable requirements will be required within next five years and add this amount to the 24 fibers.

Allow 12 fibers per location plus any other fiber cable needs such as IOF or Fiber Ring plans for the route. Place a DS-2 SONET multiplexer at first location due to it having the capacity to provide another DS-1 should other customer request it. Place ODLC at second location to provide DS-0 and DS-1 services.

Scenario 2

Service Order Requirements: 1 DS-0 and 1 DS-1.

Distance from CO: 7 KF.

Location Type: Convenience store within a residential area.

Existing facilities: 15 spare pairs in the distribution cable and 30 spare pairs in the feeder cable.

Solution: Respond to Market Line Of Business (LOB) that the Facility Available Date is two weeks from now with concurrence of Construction. Place HDSL since it is unlikely that there will be additional DS-1 requirements.

Scenario 3

Service Order Requirements: no DS-0's and 3 DS-1's.

Distance from CO: 6 KF.

Existing facilities: 600 pair copper cable with 50 spare pairs.

Solution: Respond to Market Line Of Business (LOB) that the Facility Available Date (FAD) is three weeks from now with concurrence of Construction. Place fiber cable and a DS-2 SONET multiplexer. LOB responds back that customer will not accept four week (FAD plus Standard Interval) due date. Your response will be that this was the agreed upon procedure and the FAD could only be shortened by a few days if we placed HDSL, but our goal is to provision DS-1's via fiber cable due to the benefits it provides.

Scenario 4

Forecast Requirements: no DS-0's and 1 DS-3.

Distance from CO: 4 KF.

Location Type: Downtown business environment.

Existing facilities: 600 pair copper cable with 30 spare pairs.

Solution: Place 12 fiber cable plus study route as discussed above and one SONET multiplexer. Plan to place ODLC for DS-0 relief.

Scenario 5

Service Order Requirements: 22 DS-0's and no DS-1's

Distance from CO: 13 KF.

Location Type: Single family home in a residential area.

Existing facilities: 24 spare pairs in the distribution cable and 26 spare pairs in the feeder cable.

Solution: Place PG Flex utilizing HDSL technology via existing 5 spare pairs in copper cable. Remove and reuse system at another location after services are disconnected.

11.0 DISTRIBUTION AREAS

The purpose of a Distribution Area (DA) is to manage the distribution facilities by performing the following major tasks:

- Detailed Distribution Area Plan
- Identifying Distribution Relief Requirements
- Evaluating Distribution Relief Alternatives
- Selecting Distribution Relief Job

11.1 Detailed Distribution Area Plan

In accordance with the objective to segment the CO area into administrative entities, the DA is the geographic entity for managing distribution facilities. These DAs should administer between 200 and 600 ultimate living units. This task is accomplished by utilizing a Detailed Distribution Area Plan (DDAP).

1. The five documents that make up the DDAP are as follows:

- DA Study Map which shows terminal locations and areas, cable routes and sizes, DA boundaries, and interface locations.
- DA Schematic which shows cable sizes, pair counts assigned to each cable, and fill boxes for each distribution cable, each backbone cable, and each feeder cable.
- Interface Site Sketch which shows the interface site and provides information on type of property and easement.
- General Information Narrative which contains miscellaneous information about type of service demand and other factors that affect the size of cables and interfaces.
- DA Documentation Record which gives the theoretical distribution gauge and DA boundaries.

2. The DDAP continues the division of the DA into Distribution Cable Areas and Terminal Areas for administrative purposes.

11.2 Serving Area Interface

1. The DDAP is the starting point for Serving Area Interface (SAI) implementation.

2. **Avoid mixed administration of feeder and distribution facilities to any terminal. Never feed an SAI with distribution facilities.**

3. **SAI design is the choice for feeder to distribution interfacing because it handles growth and churn with a maximum of flexibility and a minimum of work force activity.**

4. SAI design requires the placement of hardware that interconnects the distribution and feeder pair.

5. In SAI Design, most distribution pairs are permanently assigned to a specific living unit or business location.

6. The feeder cable(s) that enter the SAI and the distribution cable(s) that leave the SAI should be sized ultimately and terminated permanently in the SAI.

7. A loop make-up is required for all cables that feed a SAI.

8. A Metallic Automated Cross Connect System (MACS) that can remotely administer metallic cross connections from a Personal Computer (PC) through robotics and remote access services is approved for Bell Atlantic. The MACS eliminates the need for field dispatches to SAI's by performing the same cross connection functions as manual cross connect boxes today using precious metal pins to make cross connections. Detailed guidelines and specifications for deployment of Automated Mechanical Cross Connect Systems will be available in the third or fourth quarter of this year. In the interim, for initial deployment planning we recommend that only SAIs with <u>at least</u> the potential for 240 actions per year be considered for MACS deployment. Refer to TP-G98-001.

11.3 Identifying Distribution Relief and Rehabilitation Requirements

1. LATIS is a primary tool used to identify, by cable and complement, those areas that require facilities relief and/or rehabilitation.

2. For loop tracking purposes, it is recommended that a separate TU be defined for each DA. Defining an area to a separate TU reduces the initial analytical work performed.

3. **Detailed analysis is required for any Distribution Area (DA) that ranks high in LATIS to decide if the high cost is a single or recurring event. Work with the maintenance group(s) to determine the problem and solution.**

4. LEVM, LATIS Edit Validation Module, should be run monthly to compare the LEVM/LATIS dictionary with the data contained in the individual LEAD wire center data bases. LEVM assumes the LEAD contains the most accurate data (reflecting Cable and Pair associations with Taper Codes) and will make suggested updates to LATIS based on this comparison.

5. LART and LAD both contain report information from LATIS on assignment and maintenance activity. LAD is a report writer, providing LATIS summarized data in a friendly on-line environment so that the user can obtain information in a variety of ways without receiving a mountain of paper reports.

6. For loop tracking purposes, TUs are recommended rather than larger Allocation Area (AA) size units. Once cable pair ranges are established and associated with each TU, various reports are available in the form of LATIS outputs.

7. LATIS will be utilized to determine the most likely cause of excessive operation expenses in the outside plant network: shortage or deterioration. A shortage is defined as an insufficient number of good cable pairs to handle all service order and maintenance activity.

8. Fill data must be defined for each SAI, feeder fed building terminal, and TU, so that fill levels may be generated to the AA, DA or CSA level. This data will be helpful in feeder and sub-feeder route analysis, and local threshold values should be set and updated. All fill levels are to be measured against forecasted growth LEAD obtains fill totals by adding the fill for all feeder complements associated with each TU.

11.4 Evaluating Distribution Relief and Rehabilitation Alternatives

1. **Feeder to distribution ratios as well as distribution pairs per living unit will take into account existing living units, ultimate living units, undeveloped land areas, ultimate land usage, and business requirements.**

2. The typical feeder to distribution ratio for residential zoned areas is 2 to 3. The typical feeder to distribution ratio for commercial zoned areas is 1 to 1.

3. Distribution pairs per living unit typically range from 2 to 5.

4. Consider the advent of ISDN, Internet access, computers, business lines and fax machines required for telecommuting when determining feeder to distribution ratios as well as the number of distribution pairs per living unit.

5. Avoid establishing unnecessary TUs, DAs, or SAIs because of the additional administrative workload this creates. New TU and DA numbers must be established for new DAs.

6. **Place larger SAIs to serve an area as opposed to establishing many smaller SAIs to serve the same area.** For example, place one 3600 SAI in lieu of two 1800 SAIs.

7. When growth occurs next to an established DA or within an established DA where the SAI and backbone distribution cables are not sized adequately to include these additional requirements, analyze the cost differential between replacing the SAI with a larger SAI versus establishing an additional DA and/or splitting the existing DA.

8. Replacing an existing SAI with a larger SAI may be required when the feeder or distribution cables require reinforcement and/or for maintenance reasons.

9. In the process of designing a job in a DA, include the removal of all lead and odd count pic cables.

10. Cables that have ready access terminals must be analyzed to determine if there are sufficient troubles to justify the replacement of the cables, and/or the terminals with fixed count terminals. This will require coordination between the FMC/DBT and the local maintenance groups.

11.5 Distribution Cable Area

The Distribution Cable Area are units of plant within a DA, consist of groups of adjacent terminal areas, and are sized so that each makes maximum use of one or more 25 pair binder groups assigned to it.

1. Observe transmission guidelines when gauging distribution cables.

2. Update Loop Make-Ups and Loop Qualification Codes whenever a cable is placed or changed and the transmission or cable counts are affected.

11.51 Aerial Distribution

1. Select permanent locations for pole lines considering:

   - Future road widening or realignment
   - Expansion of other utilities
   - Bridge reconstruction
   - Special problems such as road, railway, and power line crossings
   - Safety and convenience of workers and the general public

2. Obtain necessary permits for:
   - Building or maintaining pole lines on private property and public right of way
   - Crossing railroads
   - Crossing waterways
3. Coordinate with other utilities with respect to:
   - Possible joint use
   - Proper span length requirements
   - Proper bonding and grounding
   - Guying requirements
4. When possible, poles should be placed on the property line.
5. Design pole lines for ultimate needs, considering pole lines classification, storm loading, and clearance
6. Use the most economical span length within the constraints imposed by the distribution plan, as well as any imposed by local practices.
7. When adding cable to an existing line or when establishing a joint use line, check that the pole strength, guying and clearances are adequate.

11.52 Buried Distribution

1. Use joint trenching wherever appropriate, following local agreements where applicable. Every effort must be made to coordinate with the other utility companies to accomplish this. Joint trenching is only used when a Joint Use Agreement has been negotiated between Bell Atlantic and the utility company. Efforts must be made to negotiate such agreements through your Bell Atlantic Contract, Agreements, and Third Party Attachment Groups, if these agreements do not already exist.
2. Dual buried plant construction (cable on both sides of the street) should be used only if it is economical or practical to do so. Consider road crossings as an alternative means to serve customers on the opposite side of the street. Road crossings must be placed in advance of paving and will require detailed job design and coordination with the property developer and other utilities. Roadside trenching is always preferable to backyard construction.

3. In the buried environment, pedestals should be deployed instead of out-of-sight construction, i.e. encapsulated preterm. In the *limited* event that out-of-sight construction is mandated by a municipality, the use of hand-holes is a requirement.

4. In buried developments, place at least one five (5) pair buried service wire in the South or one six (6) pair in the North. Consider additional line growth rate and economics of the area that may indicate the need for two 5 or 6 pair buried service wires.

5. Power transformer locations must be noted on the work print with proper bonding attachment locations specified.

6. Existing buried and underground utilities must be located and marked by the locating contractor such as "Miss Utility" or "DigSafe" prior to the placement of any buried or underground structures.

7. Place a metallic conductor for locating purposes in the trench with buried and underground dielectric fiber cables that are not in a trench with a copper cable. Refer to PR-89-068.

11.53 Copper Distribution Rehabilitation/Maintenance

Documentation demonstrating the rationale for copper replacements will be required in the estimate package. The use of Netcam for comparing expenditures and annual operating costs is still in effect in BA South. BA North should also provide similar supporting documentation such as the Annual Cost Penalty, the number of code 4's and the number of facility modifications for the area to be rehabilitated. Guidelines are being developed on how to quantify and rank rehabilitation areas that will include methodologies to easily determine cost benefits and pay-back analysis. In the interim, the following guidelines will be used to ensure that any proactive approach to maintaining the network is economically sound.

1. All copper cable replacements should be supported and documented by the use of LATIS, Predictor, Maintenance Tracking Administration System (MTAS), Cable Report and Administration System (CRAS) and/or other local data. The emphasis should be to replace only what is necessary to maintain service. LATIS is a tool which captures both the service order activity as well as the maintenance costs associated with a clearly defined geographic area (i.e. wire center, feeder route, distribution area, tracking unit, etc.).

2. This supporting data can be used to accurately portray the costs associated with maintaining a geographic section of plant. The resulting cost data must be an integral part of any proactive approach to maintaining the network.

3. All cable replacement shall be prioritized for completion in accordance with LATIS cost penalty rankings. The average cost per assigned pair as determined through LATIS may be used to rank the DA/TU. The capital expenditure of the proposed job should be compared to the operational expense.

4. Service requirements, engineering judgment, customer complaints and municipal requirements are additional factors to consider.

5. Air pressure programs, Proactive Preventative Maintenance (PPM), Predictor, Find-it-Fix-it, DaVaR and other expense reduction initiatives must be maintained in order to maximize the life of copper plant.

11.54 Fiber in the DA

1. Extending fiber into a DA has been under active investigation for several years including the controlled introduction of Fiber to the Curb (FTTC) in a number of locations. We do not plan to offer video services for at least two years, but FTTC will likely be the primary fiber cable fed platform that is used to deliver video services to the home.

2. The DA must require full rehabilitation and the area must have a high population density such as a typical Urban or dense Suburban neighborhood prior to FTTC being an economical consideration for use today. This is essential to ensure high utilization of the serving terminal known as an Optical Network Unit (ONU) to reduce the cost per line to a level comparable with copper.

3. There are still several technical, operational and economic issues to be resolved before expanded deployment in Urban and dense Suburban areas can progress. Fiber to the Home (FTTH) seems to be the logical progression of this trend. However, major economic, technological, operational and regulatory hurdles need to be overcome before this becomes a viable architecture. The current focus is to expand the use of fiber in the feeder routes.

11.6 Distribution Terminal Areas

1. Terminal Areas designate the living unit to distribution cable pair correlation at individual terminal locations. This identifies which living unit is assigned to specific terminals.

2. Include wiring limits and terminal blocking information on the work print.

3. Use a minimum of a 25 pair fixed count terminal and make the full 25 pairs available. This will assist in minimizing facility modifications.

4. Primary and secondary pairs should be assigned to each living unit. Use a preferred count to ensure that allocated pairs will be assigned first. This simplifies the splicing operation and minimizes the need for subsequent rearrangements.

11.61 Building Entrance Facilities

1. Building entrance terminals and facilities must be sized to meet the current and expected needs of the customer.

2. Protect and terminate the entire entrance cable upon placement. Consideration must be given to the use of drop wire and NIDs for smaller service needs in lieu of building cables and terminals. This alternative will depend on a variety of factors including whether it is an urban, suburban or rural environment. Factors like storm load, potential services expansions, and future reconfiguration expenses should be considered. The National Electric Safety Code (NESC) Section 23 covers the various clearances that must be maintained for the proper connection of aerial plant to buildings.

3. Consider access requirements, employees safety, and equipment security when negotiating entrance facility and building terminal locations.

4. Specify the ground locations for all building terminals on the work print.

11.62 Rate Demarcation Policy (RDP)

1. All companies must follow established tariff, RDP policies and/or Bell Atlantic policies. ***Refer to PR-D96-031*** which details state-to-state RDP tariff policies for the South, and the 1997 Order on Reconsideration regarding Sections 68.213 and 68.104 of the Commissioner's Rules for the North.

2. Each engineer must be knowledgeable of the Bell Atlantic policies in effect.

3. Exceptions may cause deviation. When in doubt, consult the State Regulatory group who has responsibility for that jurisdictional area.

4. Bell Atlantic has established an MPOE policy in all states except New York, New Jersey, and Washington D.C. This applies to multiunit premises in which wiring was installed after August 13, 1990.

5. For building existing as of August 13, 1990, the demarcation point shall be determined in accordance with the local carrier's reasonable and non-discriminatory standard operating practices.

6. There will be no plant construction beyond the RDP except at customer expense. Services must be terminated at the RDP/MPOE except where providing service to an Inter-Exchange Carrier (IEC) directly into a point of termination or for services DS-3 or above, which must be terminated on the customer's premise at a mutually agreed upon location.

7. The FMC/DBT has the final responsibility for facilities and must ensure that these requirements are clearly communicated to the customer to eliminate all possibilities for confusion.

8. Any FCC Part 68 Registered jack may serve as a NID. To eliminate confusion and to simplify the identification of the RDP, Bell Atlantic has chosen the RJ11C plug and jack arrangement as the preferred standard network interface jack for basic DS0 service.

9. Bell Atlantic policy requires that Network Interface Devices (NIDs) be installed at the RDP for the provisioning of the regulated telephone services and that it must be accessible to the customer. NIDs used for the provisioning of the regulated telephone services must not be interpositioned on the customer provided wire beyond the RDP.

10. All Installation and Maintenance (I&M) work performed on the customer's side of the RDP is billable at the prevailing Nonregulated Time and Material rates except as covered by a warranty or maintenance plan. This includes all jurisdictions with or without the presence of a NID at the RDP.

12.0 STRUCTURES

12.1 Housings

1. Select the appropriate housing for the requirement. The options include Controlled Environment Vaults (CEVs), Huts, cabinets, and customer premises RTs. Commercial Office buildings often provide appropriate environments for ODLC.

2. NFP and the FMC or DBT should consider Right of Way (ROW) restrictions and the difficulty in obtaining additional ROW when selecting RT housings.

3. The physical security of a customer premises installation must be ensured. A locked room or locked cabinet must be provided accordingly. BA personnel must have 24 hour access to the site.

4. Emergency power requirements such as connections for generators and power transfer switches should be anticipated in order to maintain service in disasters and other events where commercial power service may be unavailable for extended periods of time.

12.2 Conduit

1. New structure placement should be considered only as a last resort. Some circumstances which may justify new conduit placement are as follows:
   - Prior to a road resurfacing or in conjunction with a road widening
   - Bridge construction or reconstruction
   - Within a new office park
   - Requirements in and out of RT structures
   - Requirements for pathway between poles and underground structure
   - Requirements to tie into building conduit pathways

2. In direct buried applications, the use of conduit in the main trench, including innerduct, should be limited to areas where future trenching is prohibitive, as in fenced backyards and in urban environments. Any deviation from this policy will require that a written Business Plan for the use of the conduit be prepared to prevent other utilities from the opportunity to usurp the conduit for their own use.

3. Consider Multi-pack Duct instead of 4" PVC and innerduct, as it is more economical under many circumstances.

4. Consider directional boring as an alternative to open trenching only where restoral costs provide justification such as road, driveway, and parking lot crossings.

12.3 Aerial Innerduct

Aerial innerduct carries a very high installed first cost. Ubiquitous use of aerial innerduct is not economical and should be limited to the following applications: *Studies were conducted in 1997 to support this policy.*

1. Areas with no truck access (i.e. back yard, restricted right-of-way, etc.)
2. Congested pole lines which require snaking the fiber cable over and/or below side leg cables
3. Areas where road widening is pending or is highly likely
4. Heavy tree areas where lashing is not possible or tree abrasion is likely
5. Where high-speed/high production fiber blowing placements are available
6. To facilitate the future relocation of aerial coils when the coils are placed in anticipation of future splice requirements

13.0 SELECTING DISTRIBUTION RELIEF AND REHABILITATION STRATEGIES

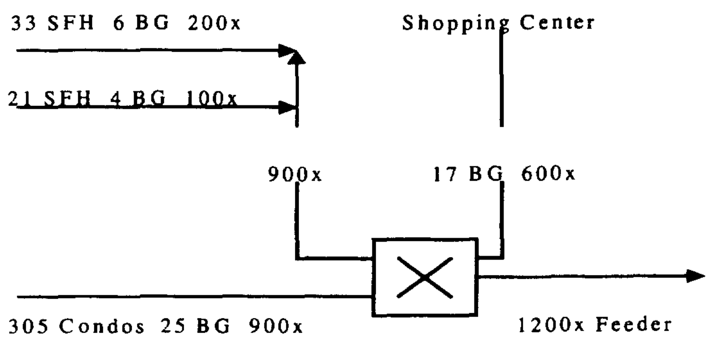
The following are examples of DA requirements and solutions:

Scenario 1

Requirement: A new SAI is needed to administer 369 new living units under construction and a requirement of 422 business pairs to serve a shopping center planned for the development.

Solution: Based on the current service demand for this area, allocate four (4) distribution pairs per living unit for the 54 Single Family Homes (SFH), two (2) pairs per living unit for the 315 condominiums, and allocate 2 feeder pairs per living unit for all living units.

Count the ultimate living units on each lateral, apply the multiplying factors as selected above, and allocate 25 pair Binder Groups (BGs) accordingly to size each distribution cable. Accumulate these binder group requirements back through the backbone cable and toward the interface. For the feeder, add all ultimate living units, multiply by 2, then add the business pair requirements.

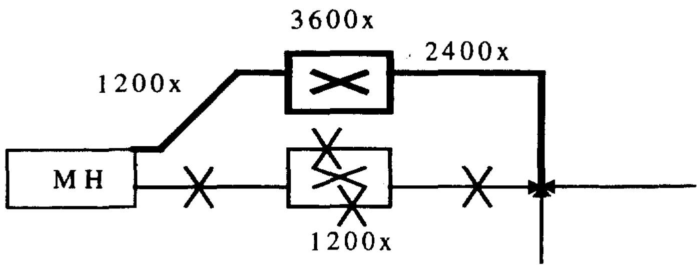


Place 3600x SAI providing 2400 distribution pairs and 1200 feeder pairs.

Scenario 2

Requirement: An 1800 pair 3M SAI administers distribution cables which feed an existing development. The binding posts are severely damaged and corroded, and the box is not large enough to accommodate the additional line growth that is occurring in the area. There is significant trouble history and this DA repeatedly ranks high in LATIS.

Solution: Replace the interface with a 3600 interface. This interface is sized to accommodate the needs of the DA, based on the current service demand and the forecasted growth for the area. Replace the cables as required to accommodate the growth. Work with cable maintenance to ascertain the actual cause of the troubles and include the resolution in your job design.



14.0 CENTRAL OFFICE EQUIPMENT

14.1 Digital Cross Connect Systems (DCS)

1. DCS Planning is accountable for deploying, assigning and monitoring both manual (MDSX) and electronic (EDSX) digital cross-connect systems in the COs. Network Facilities Planning (NFP) is the Facilities Management interface with DCS Planning.

2. To ensure compliance with DCS strategic plans and to efficiently deliver current and future services. NFP must consult with DCS Planning to obtain appropriate MDSX/EDSX terminations associated with the addition of new loop network elements or the cabling/ re-cabling of existing loop network elements within the CO. These network elements include office repeater shelves, ODLC and optical/electrical multiplexers (synchronous and asynchronous).

3. Any reference to metallic interconnection between Add-Drop Multiplexers (ADMs)/COTs and DCSs in this document assumes the use of DDP-like interconnection technology. ADMs/COTs and DCSs should not be directly interconnected or hardwired.

4. The following cabling strategies are recommended for general installations in the CO if no precluding specific requirement is known. They should be considered informational only and are not substitutions for DCS Planning consultation:

14.11 SONET Add/Drop Multiplexers (ADM)

In order to enable Bell Atlantic to offer future services and derive the maximum benefit from SONET deployment, all interconnection in the central office shall be completed at SONET rates, namely STS-1 and optical. Deployment of DS-3 and DS-1 interfaces on SONET ADMs in the CO should be limited to those situations where SONET interconnection would be impractical. An example of such a situation is the lack of a SONET-capable DCS. Direct interconnection between ADMs as between an OC-48 and its tributaries shall be optical. However, STS-1 interconnection between ADMs may be considered when the increased granularity over optical is desired or required, for example, in smaller central offices.

Since this equipment predominately is used to deliver customer hi-cap special services, it should be connected into the EDSX environment if one exists. Because the quantity and type of traffic that will use this equipment is usually unknown at time of installation, splitting the terminations is recommended.

14.12 OC-3 Systems

- In offices with both BDCS (Broadband) and WDCS (Wideband) and the BDCS is not a Lucent DACSIII, cable (1) STS1 drop to the BDCS for DS3 services and (2) STS1 drops to the WDCS for DS1 services.

- In offices with both BDCS and WDCS and the BDCS is a Lucent DACSIII, cable (1) DS3 to the BDCS for DS3 services and (2) STS1 drops to the WDCS for DS1 services.

- In offices with only a WDCS, cable all muldems to the Manual DSX at the DS3/STS1 level (MDSX3). This accommodates connection to the WDCS at either DS3 or STS1 rates.

- In offices with only a BDCS, cable (1) DS3 to the BDCS for DS3 services if BDCS is Lucent DACSIII. Cable (1) STS1 to BDCS for DS3 services if BDCS is Alcatel 1633 or DSC IMTN. Cable remaining muldems as DS1 drops to the MDSX1 for DS1 services.

14.13 OC-12 systems

- In offices with both BDCS and WDCS that support optical interfaces, terminate on the BCDS OC03 interface for DS3 services and on the WDCS OC03 interface for DS1 services. The quantity of each type of termination is to be determined by Network Facilities Planning.

- In offices having both BDCS and WDCS that do not support optical interfaces and the BDCS is not a Lucent DACSIII, terminate on the BCDS STS1 interface for DS3 services and on WDCS STS1 interface for DS1 services. The quantity of each type of termination is to be determined by Network Facilities Planning.

- In offices having both BDCS and WDCS that do not support optical interfaces and the BDCS is a Lucent DACSIII, terminate on the BDCS DS3 interface for DS3 services and on the WDCS STS1 interface for DS1 services. The quantity of each type of termination is to be determined by Network Facilities Planning.

Other Loop Network Elements used to deliver customer hi-cap special services:

This category includes optical DS2 systems (e.g.: SONEPLEX, FLM6, QFLC,DDM Plus), other asynchronous multiplexing equipment, and office repeater shelves. This equipment should be connected into the EDSX environment if one exists. Terminate on the WDCS DS1 interface.

14.14 ODLC/NGDLC CO Terminals

1. This equipment and the associated Switch Line equipment should be cabled to the EDSX environment. However, cabling limitation will be imposed for economic and utilization concerns. Initially, each COT will be allowed 20 DS-1 terminations unless Network Facilities Planning has documentation that additional terminations are required. After those 20 terminations exhaust, another 20 will be allowed, and then finally 16 to complete a full shelf. 20/20/16 were chosen to match the Litespan's cabling complement.

2. The RADSL application proposed for use with Litespan COT equipment would not alter this configuration. All data services will be groomed within the Litespan onto an OC3C output and transported at that rate for access into an ATM switch. DCS equipment will unlikely play a role in this transport.

3. In offices with existing or planned narrowband digital cross-connect systems (NDCS), ODLC planning should utilize the Integrated Network Architecture (INA) feature of the ODLC to groom DS0 non-locally switched specials and non-switched specials into DS1s terminated on the MDSX1 that are cross-connected to the NDCS. The NDCS would route the DS0 non-locally switched specials into IOF DS1s associated with the appropriate terminating end office. This reduces main distributing frame appearances, ODLC narrowband channel units and D4 equipment. It also provides a more efficient path through the network.

4. If a central office does not have an NDCS and if an ODLC or GR-303 job is being planned that will include engineering for 100 or more non-locally switched and/or non-switched specials then ODLC planning should contact DCS Planning and Capital Management for a possible NDCS deployment.

5. If a CO does not have a NCDS and if an ODLC or GR-303 job is being planned that will include engineering the 100 or more non-locally switched or non-switched specials then ODCL planning should contact DCS Planning and Capital Management for a possible NDCS deployment.

6. There may be cases where the COT is already terminated on an EDSX. In those offices, the use of the EDSX should continue. However, since this arrangement requires hardwired port assignments on the Wideband Digital Cross-connect System (WDCS), entire channel banks should not be arbitrarily cabled. Wideband terminations should be provided as needed to accommodate 3-5 years interface group growth and other wideband requirements. The physical wideband cable characteristics of the associated channel banks should also be considered.

14.2 Fiber Frames

- FDFs must be deployed in all wire centers and large customer premise locations.

- Customer premise locations and RTs will require either mini FDFs or fiber interconnect cabinets and panels, depending on the complexity and flexibility needed at the site.
- FDFs must be deployed in all wire centers to ensure proper transition of OSP fibers to FOTs equipment.
- Institute a fiber jumper management system and specify appropriate jumper lengths when establishing connections.
- Terminate fiber cables on FDFs and prohibit the use of LCIE type cabinets in COs.
- Terminate all (both allocated and unallocated) fiber to the FDF.
- Wherever possible, remove all spare fibers and cables from LCIE cabinets and reterminate these facilities to FDFs. Consider the age of the fiber, connector type and potential usage prior to reterminating these fibers. For example, there may be an odd sized cable placed in 1986 with rotary/mechanical connections which will be required for a future OC-48 for IOF. It may also be one of the remaining multi-mode cables.
- Where possible, there should be only one centralized FDF system in each CO.
- Design and install the maximum number of FDF bays with properly sized fiber cable pathways.
- Use FDF design layout procedures to accommodate zoning of OSP cables and spreading of electronics on the FDF.

15.0 NETWORK ENGINEERING AND CAPACITY MANAGEMENT

The following process is the agreement between Network Facility Planning (NFP), Interoffice Facility & Capacity Management (IOF/CM) and CO Engineering (COE) to facilitate the implementation of the Engineering Request (ER).

1. NFP will engineer the ER and will be accountable for providing details specified in the ER document. NFP must provide the funding source on all ERs except for 57, 357, and 557 accounts. IOF/CM will provide the funding source on the aforementioned accounts. Customer name and service order number will be provided on all expedited ERs. The approved Standard Intervals will be used for all non-expedited ERs. Strategic Alliance models will be used when applicable.
2. NFP will forward the completed ER to IOF/CM for budget approval. All ERs will be transmitted via Mechanized Engineering Request.
3. IOF/CM will provide the funding source required on the ER to meet budget requirements.
4. IOF/CM will contact NFP's originator when the budget process affects service dates.
5. IOF/CM will forward approved ERs to COE via MER system.
6. COE will make all service dates and contact the originator if the date cannot be met based on availability of equipment and installation work force. The COE engineer shall communicate all service date changes to the originator until the job completes.
7. COE will send a copy of the Expedited TEOs to Vendor and Vendor Management Engineer.
8. COE will distribute all TEOs with the TEO information sheet to the Vendor, Vendor management, E1, Operations, ER Originator, Power/Space/Frame and Engineering Library.
9. The measurements for standard and expedited ERs for NFP, IOF/CM and COE will be tracked in the Mechanized Engineering Request (MER) system.
10. The measurements for standard and expedited ERs and TEOs for COE will also be tracked in the Network Engineering Request Lifecycle (NERL) system.
11. The NFP/(IOF/CM)/COE Process will review this process and measurements quarterly.

16.0 SWITCH ENGINEERING

This section is for informational purposes.

At the end of 1997, Bell Atlantic had 39,763,000 access lines in service and 92% were served from a local digital switch. The 3 embedded digital switch suppliers in Bell Atlantic are Lucent, Nortel, and Siemens for the 2,582 digital switches in service. The remaining 8% of the access lines at the end of 1997 were on 86 analog switches that are all scheduled to be replaced by the year 2001.

16.1 Digital Switch Interface

1. The current digital switch interface, Technical Requirements (TR) - 008 does not allow for the integration of numerous services such as Foreign Exchange (FX), ISDN and special services. Spare TR-008 digital switch interfaces will continue to be utilized for loop facility growth jobs.

2. Generic Requirements (GR) - 303 is the 'next generation' digital switch interface that eliminates proprietary signaling and will provide for the integration of all Plain Old Telephone Service (POTS), ISDN and switched specials. GR-303 introduces concentration outside of the switch and its Time Slot Interchange (TSI) capability can operate with less than a 1 to 1 ratio of DS-0 interfaces (with DS-1s) to the switch. GR-303 additionally provides 4 "D" channels from a single DS-) (quarter time slot) for BRI ISDN services.

3. GR-303 First Office Applications are currently underway and limited deployment of these switch interfaces. This deployment will create a fundamental change in network architecture. Future documentation will provide additional information on this subject.

16.2 Central Office Equipment Engineering (COE) Sizing and Timing

1. A 12 month interval is the first choice framework used for all Switch COE growth jobs.
2. There may be situations that justify shorter interval jobs, such as the premature triggering of building additions, premature costs associated with a second-year major area transfer and new customer requirements.
3. A 12 month growth job may not be possible due to equipment breakpoints. For example, if a growth job is required, and the smallest line unit available would constitute a 2 year job, then that is what should be ordered. Jobs should not exceed 12 month's growth whenever possible.

4. There are efforts underway to redefine the switch engineering process. The goal of switch reengineering is to reduce the total engineering cost by providing discrete "modules" of equipment. However, in some cases, the minimum defined modules may exceed a normal 1 year job. In such cases, the appropriate module should be deployed.

5. Provisioning of Integrated Digital Loop Carrier (IDLC) equipment must be based on detailed and accurate Digital Termination Forecasts. It is imperative that continual efforts be maintained between the Network Facility Planners (NFP) and Switch Capacity Planners (SCP) for growth of systems and planned analog to digital throws, to ensure the most efficient use of Bell Atlantic's resources while maintaining service standards.

6. Every effort will be made to reuse excess line and digital equipment prior to the purchase of new equipment.

7. Reuse of manufactured discontinued line/digital equipment will be evaluated on a case by case bases.

16.3 Switch Replacement

1. 1AESS switch replacements with significant triggers such as regulatory mandates such as Requirements for regulatory initiatives such as Chapter 30 (PA), Senate Bill 115 (DE), New York Service Improvement (SI) and Advantage New Jersey (NJ), customer requirements, loss of building turnaround space for replacement, number exhaust, NPA overlays (1A's can't distinguish 2 NPA's), processor and/or memory exhaust or where overriding economics prevail, should be done first.

2. 1AESS switches that do not have significant triggers should be replaced last.

3. When replacing a 1AESS switch, the new digital switch should be sized for cutover plus three years growth, in order to take advantage of the firm price quote discount associated with the switch award.

16.4 Upgrading Remote Switch Modules

When upgrading Remote Switch Modules (RSMs), consider the following:

1. RSM's should convert to an EXM2000 or standalone architecture when the Hundred Call Seconds (CCS) in an office is too high to allow the growth of an additional SM or when the fifth switch module is needed.

2. RSC to multiple entity or to standalone conversion should be considered when link exhaust occurs.

3. RCU to large RCU or to standalone conversion should be considered when link exhaust occurs.

4. Remote switches should be considered for elimination only in situations where building exhaust is occurring and a building addition is not possible or where overriding economics prevail.

16.5 Analog Line Engineering

A 96% engineered capacity with a 4% administrative spare level will be set for the majority of all offices being engineered. Should certain offices with high/low CCS patterns be known factors, SCP (Switch Capacity Planning) and NACS (Network Administration Centers) will set % fill levels at other capacities while continuing to meet service requirements.

16.6 Digital Line Engineering

1. When planning for digital growth, we are currently engineering for TR-08 and all equipment ordering will be based on DLC systems.

2. As we move into the future plans of engineering GR303, equipment planning and ordering will be issued under different guidelines. Flexibility of GR303 equipment requires that specific engineering methods and procedures be issued once the draft document has been approved.

3. When planning for Integrated Digital growth, we are currently engineering for TR-008. DLUs and other required equipment ordering will be based on the TR-008 specifications and guidelines. As we move into deploying GR-303, equipment planning and ordering will be issued under different guidelines. This is due to additional traffic engineering and provisioning requirements for GR-303 equipment.

GLOSSARY

Acronym/Abbreviation	Description
AA	Allocation Area
ADM	Add-Drop Multiplexer
ALU	Analog Line Unit
ASWC	Alternate Serving Wire Center
BCFM	Business Case Facilities Management
BCT	Break Connect-Through
CAPS	Carrier Access Providers
CAR	Customer Access Ring
CATV	Cable Television
CDP	Clear Defective Pair
CEV	Controlled Environment Vault
CLECS	Competitive Local Exchange Carriers
CNE	Customer Network Engineering
CO	Central Office
COE	Central Office Equipment
COT	Central Office Terminal
CRAS	Cable Repair and Administration System
CSA	Carrier Serving Area
CT	Connect-Through
CU	Channel Unit
DA	Distribution Area
DACS	Digital Access Cross-Connect System
DaVaR	Data Validation and Reporting Process
DBT	Design Build Team
DCS	Digital Cross Connect System
DLC	Digital Loop Carrier
DLU	Digital Line Unit
DSL	Digital Subscriber Line
DSSC	Digital Signal Subscriber Channel
FITL	Fiber In The Loop
FMC	Facilities Management Center
FTTC	Fiber To The Curb
FTTH	Fiber To The Home
HDSL	High Bit Rate Digital Sub Line
HDT	Host Digital Terminal
Hi-Cap	1.554 MB or above transmission rate
HSAR	High Speed Access Ring

IDLC	Integrated Digital Wire Center
IDWC	IntelliLight Dual Wire Center
IEC	Interexchange Carrier
IOF	Interoffice Facilities
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
LAD	Loop Activity Data
LART	Loop Analysis Report Tracking
LATIS	Loop Activity Tracking Info System
LCM	Line Concentration Mode
LDS	Local Digital Switch
LEAD	Loop Engineering Assignment Data
LFACS	Loop Facility Assignment Control System.
LIEM	Loop Electronics Inventory Module
LMOS	Loop Maintenance Operation System
LOB	Line Of Business
LST	Line and Station Transfer
LU	Line Unit or Living Unit
MBL	Minimum Base Line
MPOE	Minimum Point of Entry
MTAS	Maintenance Tracking Administration. System
NAC	Network Administration Center
NAL	Network Access Lines
NESPNS	Nynex Enterprise SONET Private Network System.
NFP	Network facilities Planning
NGDLC	Next Generation Digital Loop Carrier
NID	Network Interface Device
ODLC	Optical Digital Loop Carrier
OE	Office Equipment
ONU	Optical Network Unit
OSS	Operational Support System
PG	Pair Gain
POTS	Plain Old Telephone Service
RDP	Rate Demarcation Point
RFP	Request For Proposal
RMA	Request for Manual Assistance
RSM	Remote Switching Module
RT	Remote Terminal
SAI	Serving Area Interface
SABT	SONET Access Broadband Transport
SALT	SONET Access Loop Termination
SLC	Subscriber Loop Carrier

SONET	Synchronous Optical Network
TEO	Telephone Equipment Order
TU	Tracking Unit
UACL	Unable to Assign a Complete Loop
UDC	Universal Digital Channel
UDLC	Universal Digital Loop Carrier
UPS	Uninterruptable Power Supply
WC	Wire Center
WOL	Wire Out of Limits